SAMSUNG SECRET

SAMSUNG ELECTRONICS

Approval sheet

Customer : Changhong　　　　**DATE : Jan. 10. 2012**

SAMSUNG TFT-LCD

MODEL : LTA460HM03

Any Modification of Specification is not allowed without SEC's Permission.

NOTE :

Customer's Approval	
SIGNATURE	DATE

APPROVAED BY	DATE
	Jan. 10. 2012
PREPARED BY	DAE
	Jan. 10.2012

LCD Business

Samsung Electronics Co . , LTD.

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	1 / 28

SAMSUNG SECRET

Contents

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	2 / 28

Revision History

Date	Rev. No	Page	Summary
Jan. 10. 2012	000	all	First issued

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	3 / 28

General Description

Description

LTA460HM03 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT (Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit and a back light unit.

The resolution of a 46.0" is 1920 x 1080 and this model can display up to16.7 Million colors with wide viewing angle of 89° or higher in all directions. This panel is intended to support applications to provide a excellent performance for Flat Panel Display such as Home-alone Multimedia TFT-LCD TV and High Definition TV.

Features

- RoHS compliance (Pb-free)
- High contrast & aperture ratio
- SPVA (Super Patterned Vertical Align) mode
- Wide viewing angle (±178°)
- High speed response
- FHD resolution (16:9)
- Low Power consumption
- 12CCFLs (Cold Cathode Fluorescent Lamp)
- DE (Data Enable) mode
- LVDS (Low Voltage Differential Signaling) Interface

General Information

Items	Specification	Unit	Note
Module Size	1083 (H_{TYP}) x 627 (V_{TYP})	mm	±1.0mm
	60.3(Max.)		
Weight	13.3 (Max.)	Kg	
Pixel Pitch	0.5302(H) x 0.5302 (W)	mm	
Active Display Area	1018.08 x 572.67	mm	
Surface Treatment	Anti-Glare	-	
Display Colors	8bit – 16.7M	Colors	
Number of Pixels	1920 x 1080	Pixel	
Pixel Arrangement	RGB vertical stripe	-	
Display Mode	Normally Black	-	
Luminance of White	400 (Typ.)	cd/m^2	

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	4 / 28

1. Absolute Maximum Ratings

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

Item		Symbol	Min.	Max.	Unit	Note
Power Supply Voltage		V_{DD}	GND-0.3	*13.2*	V	(1)
Storage temperature		T_{STG}	-20	65	℃	(2)
Glass surface temperature (Operation)	Center	T_{OPR}	0	50	℃	(2),(5)
	T. Uniformity	$\triangle T$	-	10	℃	
Shock (non - operating)	$\pm$X,Y	S_{nop}	-	40	G	(3)
	$\pm$Z			30		
Vibration (non - operating)		V_{nop}	-	1.5	G	(4)

Note (1) Ta= 25 $\pm$ 2 °C

(2) Temperature and relative humidity range are shown in the figure below.
   a. 90 % RH Max. (Ta ≤ 39 °C)
   b. Relative Humidity is 90% or less. (Ta > 39 °C)
   c. No condensation

(3) 11ms, sine wave, one time for $\pm$X, $\pm$Y, $\pm$Z axis

(4) 10-300 Hz, Sweep rate 10min, 30min for X,Y,Z axis
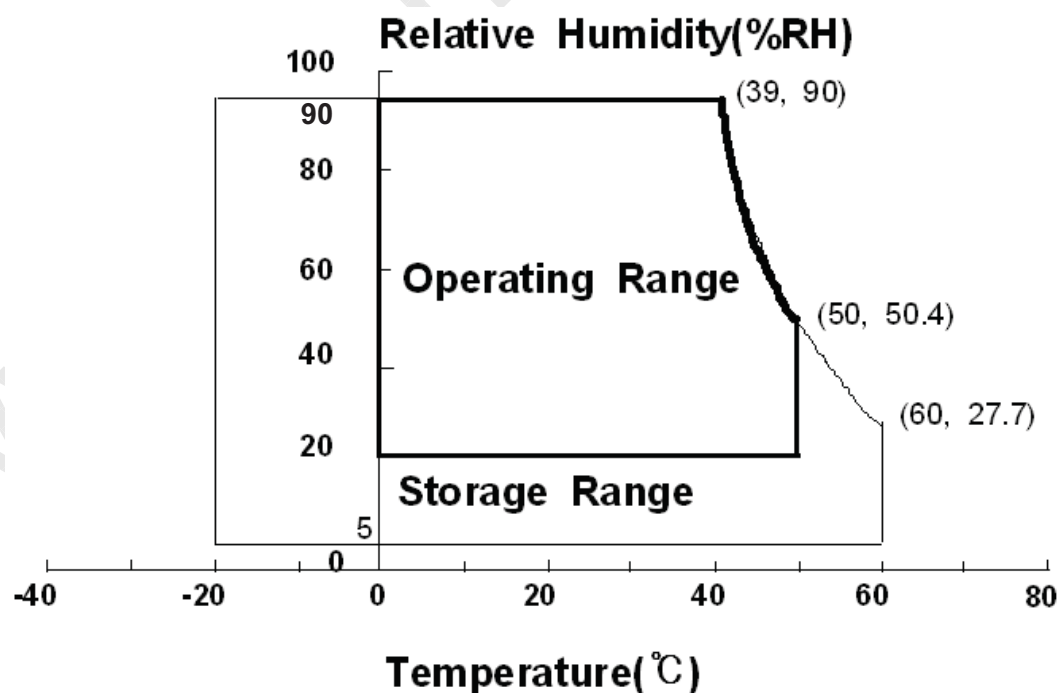
Fig. Temperature and Relative humidity range

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	5 / 28

(5) Definition of test point

5mm

5mm

①   ②

⑤

LCD Module (Active)

③   ④
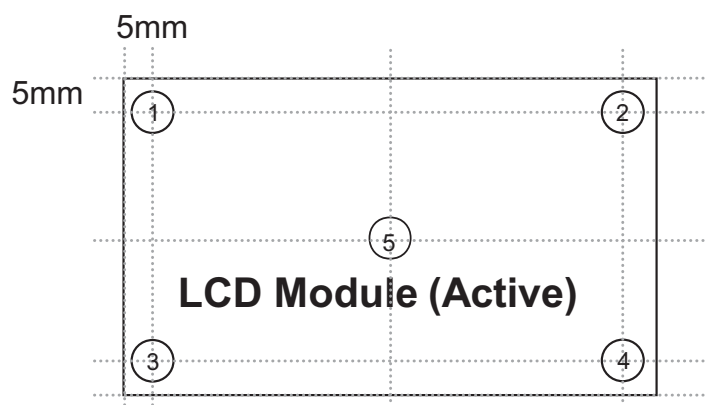
$\triangle T$ should be less than *10* $^\circ\!C$ ($\triangle T = | T_{OPR} - T_{MAX} |$)

T_{OPR} : Temperature of the center of the glass surface (Test point 5)

T1~ T4 : Temperature of each edge of the glass surface

T_{MAX} : The highest temperature of the glass surface

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	6 / 28

2. Optical Characteristics

SAMSUNG SECRET

The optical characteristics should be measured in a dark room or equivalent.
Measuring equipment : TOPCON RD-80S, TOPCON SR-3 ,ELDIM EZ-Contrast

(Ta = 25 ± 2°C, VDD=12.0V, fv=60Hz, f_{DCLK}=148.5MHz, Lamp current = SEC BLU)

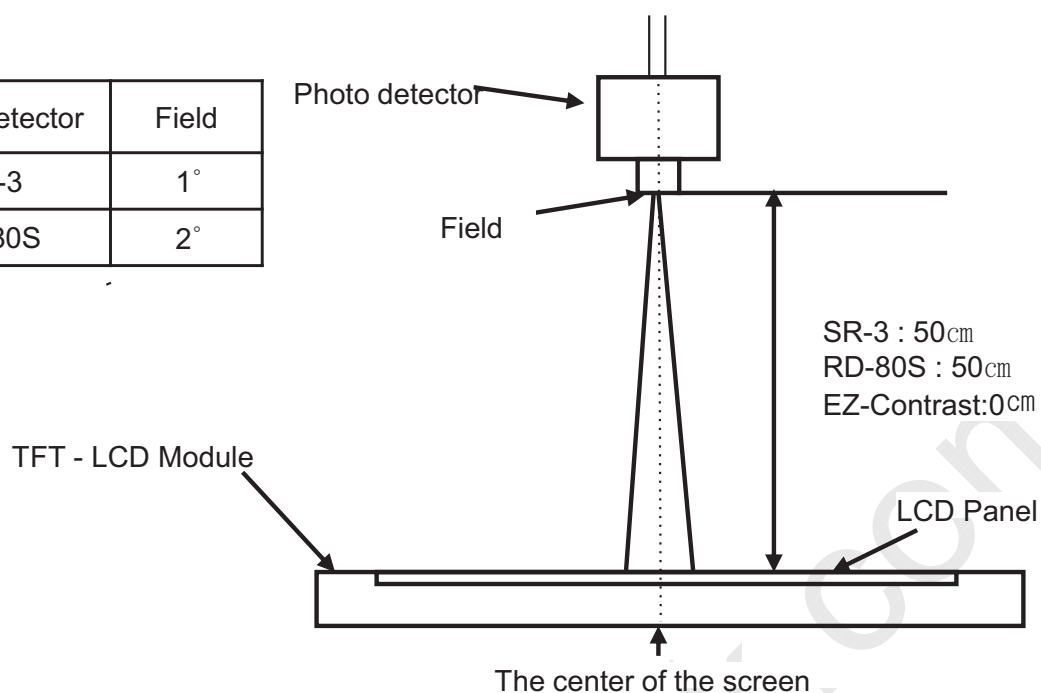| Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R		4,000	5,000	-		(1) SR-3
Response Time	G-to-G	Tg		-	8	-	msec	(3) RD-80S
Luminance of White (Center of screen)		Y_L	Normal θL,R=0 θU,D=0 Viewing Angle	350	400	-	cd/m²	(4) SR-3
Color Chromaticity (CIE 1931)	Red	Rx		TYP. -0.03	0.640	TYP. +0.03		(5),(6) SR-3
		Ry			0.330			
	Green	Gx			0.290			
		Gy			0.610			
	Blue	Bx			0.150			
		By			0.060			
	White	Wx			0.280			
		Wy			0.290			
Color Gamut		-		-	72	-	%	(5) SR-3
Color Temperature		-		-	10,000	-	K	
Viewing Angle	Hor.	θL	C/R≥10	75	89	-	Degree	(6) EZ-Contrast
		θR		75	89	-		
	Ver.	θU		75	89	-		
		θD		75	89	-		
Brightness Uniformity (9 Points)		B_{uni}		-	-	25	%	(2) SR-3

- Test Equipment Setup

The measurement should be executed in a stable, windless and dark room between 40min and 60min after lighting the back light at the given temperature for stabilization of the back light. This should be measured in the center of screen.

Environment condition : Ta = 25 ± 2 °C

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	7 / 28

SAMSUNG SECRET

Photo detector	Field
SR-3	1°
RD-80S	2°

Photo detector

Field

SR-3 : 50㎝
RD-80S : 50㎝
EZ-Contrast:0㎝

TFT - LCD Module

LCD Panel

The center of the screen

- Definition of test point

	320	960	1600
180	⑨	⑧	⑦
540	⑥	⑤	④
900	③	②	①

Active Area

○ Test Point
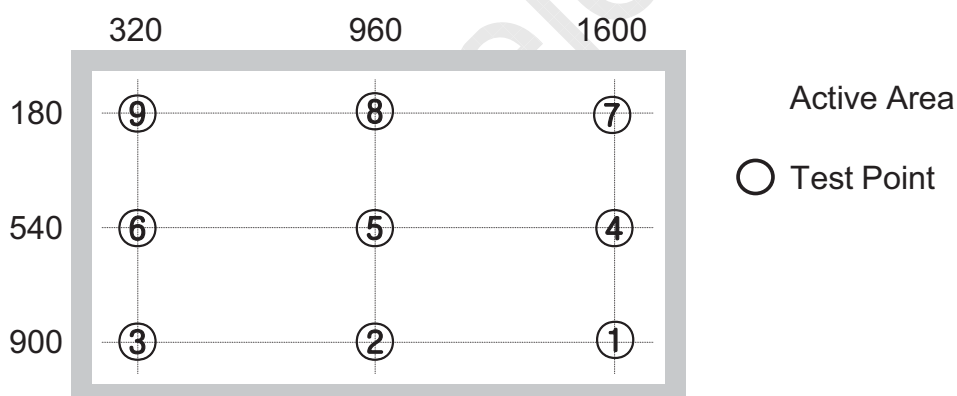
Note (1) Definition of Contrast Ratio (C/R)
: Ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel

$$C/R = \frac{G\max}{G\min}$$

Gmax : Luminance with all pixels white
Gmin : Luminance with all pixels black

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	8 / 28

Note (2) Definition of 9 points brightness uniformity (Test pattern : Full White)

$$Buni = 100 * \frac{(B\max - B\min)}{B\max}$$

　　　Bmax : Maximum brightness
　　　Bmin : Minimum brightness

Note (3) Definition of Response time : Sum of Tr, Tf

Display data | Black (data off) | White (data on) | Black (data off)

Optical Instruments Response

100%
90%
T_R
T_F
10%
0%
TIME
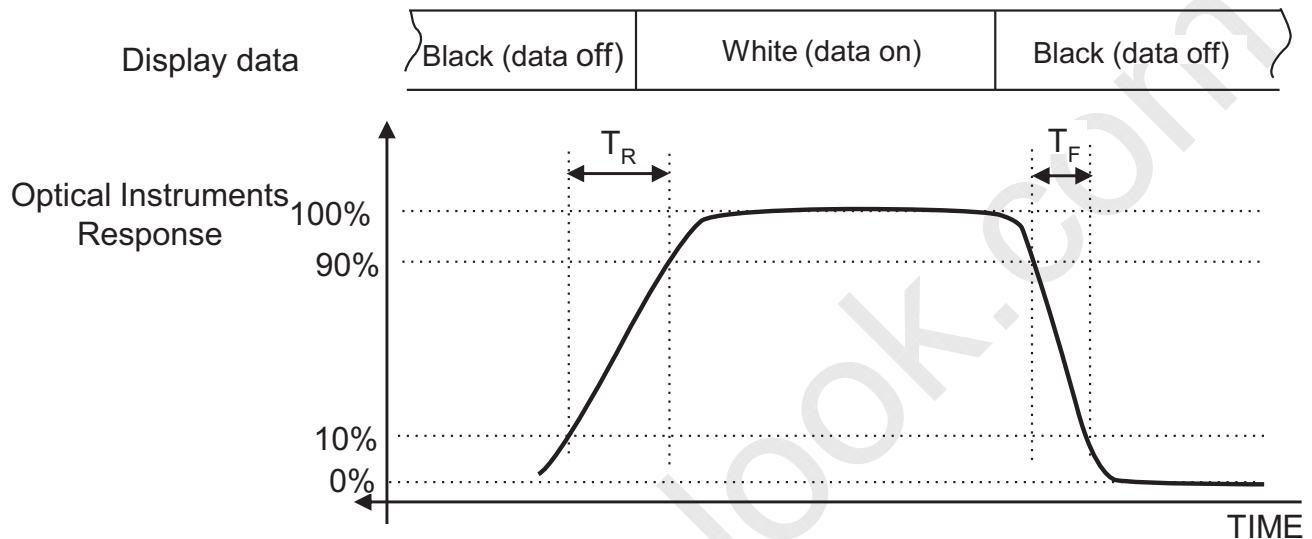
※ G-to-G : Average response time between Gray to Gray (Scale)

Note (4) Definition of Luminance of White : Luminance of white at center point ⑤

Note (5) Definition of Color Chromaticity (CIE 1931)
　　　Color coordinate of Red, Green, Blue & White at center point ⑤

Note (6) Definition of Viewing Angle
　　　: Viewing angle range (C/R ≥10)

θ_U
θ_R
θ_L
θ_D

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	9 / 28

SAMSUNG SECRET

3. Electrical Characteristics

3.1 TFT LCD Module

The connector for display data & timing signal should be connected.
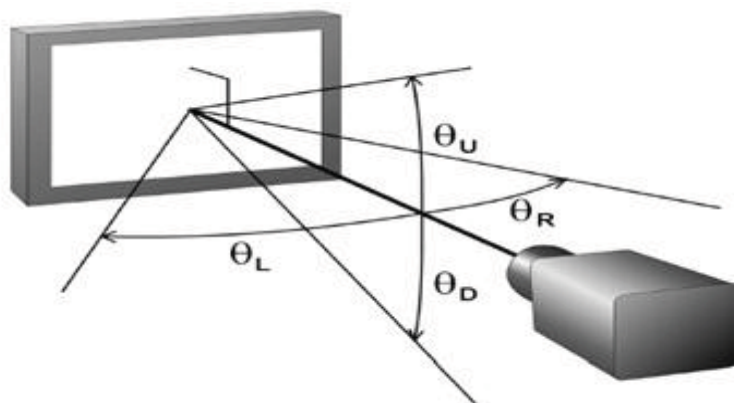
Ta = 25°C ± 2 °C

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	10.8	12.0	13.2	V	(1)
Current of Power Supply	(a) Black	I_{DD}	-	500	700	mA	(2),(3)
	(b) White		-	500	700	mA	
	(c) N-pattern		-	800	1000	mA	
Vsync Frequency		f_V	48	60	65	Hz	
Hsync Frequency		f_H	45	67.5	75	kHz	
Main Frequency		Fdclk	130	148.5	160	MHz	
Rush Current		I_{RUSH}	-	-	4	A	(4)

Note (1) The ripple voltage should be controlled under 10% of V_{DD}.

(2) f_V=60Hz, f_{DCLK} =148.5MHz, V_{DD} = 12.0V, DC Current.

(3) Power dissipation check pattern (LCD Module only)

a) Black Pattern　　　b) White Pattern　　　c) N - Pattern
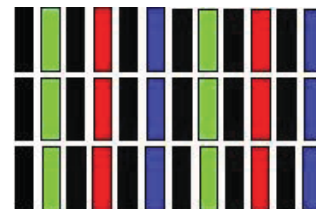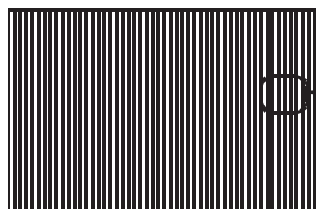
(4) Measurement Conditions
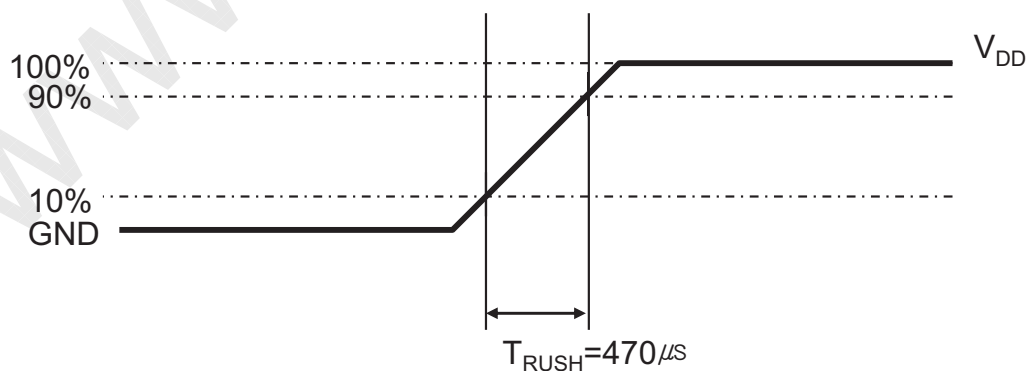
Rush Current I_{RUSH} can be measured when T_{RUSH}. is 470μs.

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	10 / 28

3.2 Back Light Unit

The back light unit contains 8direct-lighting type CCFLs (Cold Cathode Fluorescent Lamp). The characteristics of lamps are shown in the following tables.

Ta=25 $\pm$ 2°C
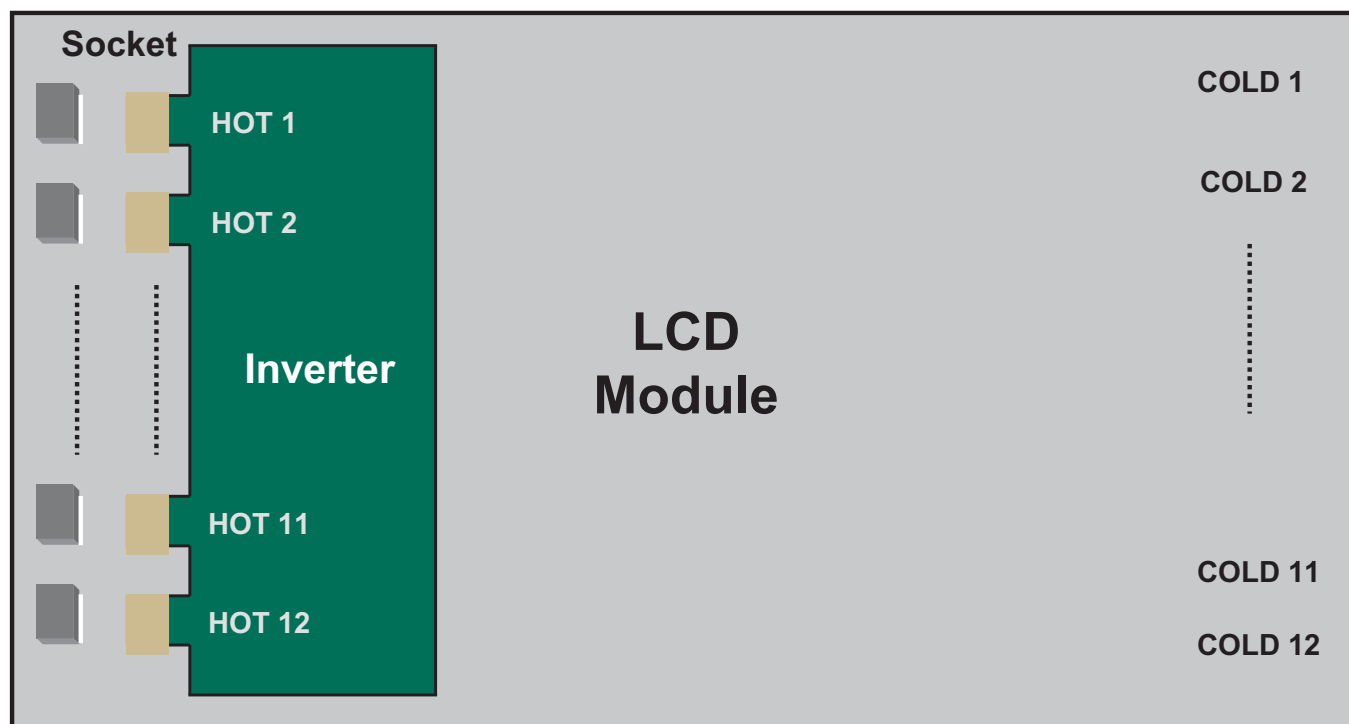
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Life Time	Hr	50,000	-	-	Hour	(1)

Note (1) It is defined as the time to take until the brightness reduces to 50% of its original value.

[Operating condition : Ta = 25$\pm$2℃, I_L = 14mArms, For single lamp only.]

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	11 / 28

3.3 Inverter Input Condition & Specification

SAMSUNG SECRET

Items	Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Input Voltage	Vin	-	21.6	24	26.4	V	Ta=25±2 °C (2)
Input Current	I_{RUSH}	Vin=24.0V Vdim =3.3V	-	-	10.71	A	(1)
Lamp Current	$I_{O,MAX}$	Vdim =3.3 V	13.3	14	14.7	mArms	
Backlight On/Off	ON	Vin=24.0 V	2.4	-	5.5	V	(2)
	OFF	Vin=24.0 V	0	-	0.8		
Dimming Control	V_{DIM}	Max Lum	-	-	3.3	V	(2)
		Min. Lum	0	-	-		
PWM Frequency	F_{PWM}	Vin=24.0 V	120	150	180	Hz	
PWM Duty	Duty	Vin=24.0 V	20	-	100	%	

Note) Power Consumption is measured when 400 [cd/m] of luminance which is the typical luminance.
Lamp Current is measured at the point before Lamp.

(1) Max Value of the Power Consumption is measured after 60 min warm-up.
(2) The ripple voltage should be controlled under 10% of Input Signal

- Additional Appendix for Supply Current & Power consumption (Only for Reference)

Items	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Current	Iin _ overshoot	Vin = 24V, Dim=3.3V (Within 1hr at BLU on)	-	7.7	8.2	A
	Iin _ saturation	Vin = 24V, Dim=3.3V (After 1hr Aging)	-	6.7	7.13	A
Power Consumption (Back light)	P _ overshoot	Vin = 24V, Dim=3.3V (Within 1hr at BLU on)	-	184.8	196.8	Watt
	P _ saturation	Vin = 24V, Dim=3.3V (After 1hr Aging)	-	160.8	171.1	Watt

* Initial turn-on time : From 0sec to 60min after turn-on

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	12 / 28

4. Input Terminal Pin Assignment   *SAMSUNG SECRET*

4.1. Input Signal & Power   Connector : FI-RE51S-HF (JAE)

Pin	Symbol	Description	Pin	Symbol	Description
1	12V	DC power supply	26	RE[0]P	Even LVDS Signal +
2	12V	DC power supply	27	RE[1]N	Even LVDS Signal -
3	12V	DC power supply	28	RE[1]P	Even LVDS Signal +
4	12V	DC power supply	29	RE[2]N	Even LVDS Signal -
5	12V	DC power supply	30	RE[2]P	Even LVDS Signal +
6	NC	NOTE1	31	GND	Ground
7	GND	Ground	32	ROCLK-	Even LVDS Clock -
8	GND	Ground	33	ROCLK+	Even LVDS Clock +
9	GND	Ground	34	GND	Ground
10	RO[0]N	Odd LVDS Signal -	35	RE[3]N	Even LVDS Signal -
11	RO[0]P	Odd LVDS Signal +	36	RE[3]P	Even LVDS Signal +
12	RO[1]N	Odd LVDS Signal -	37	NC	NOTE1
13	RO[1]P	Odd LVDS Signal +	38	NC	
14	RO[2]N	Odd LVDS Signal -	39	GND	Ground
15	RO[2]P	Odd LVDS Signal +	40	NC	NOTE1
16	GND	Ground	41	NC	
17	ROCLK-	Odd LVDS Clock -	42	NC	
18	ROCLK+	Odd LVDS Clock +	43	NC	
19	GND	Ground	44	NC	
20	RO[3]N	Odd LVDS Signal -	45	LVDS_SEL	NOTE2
21	RO[3]P	Odd LVDS Signal +	46	NC	NOTE1
22	NC	NOTE1	47	NC	
23	NC		48	NC	
24	GND	Ground	49	NC	
25	RE[0]N	Even LVDS Signal -	50	NC	
			51	NC	NOTE1

Note1) No Connection: These PINS are used only for SAMSUNG. (DO NOT CONNECT)

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	13 / 28

SAMSUNG SECRET

Note(2) LVDS OPTION : If this PIN HIGH (3.3V) → Normal LVDS format

LOW (GND) →   JEIDA LVDS format

SEQUENCE   : On = VDD(T1) → LVDS Option → Interface Signal(T2)

OFF = Interface Signal(T3) → LVDS Option → VDD

LVDS Option Sequence
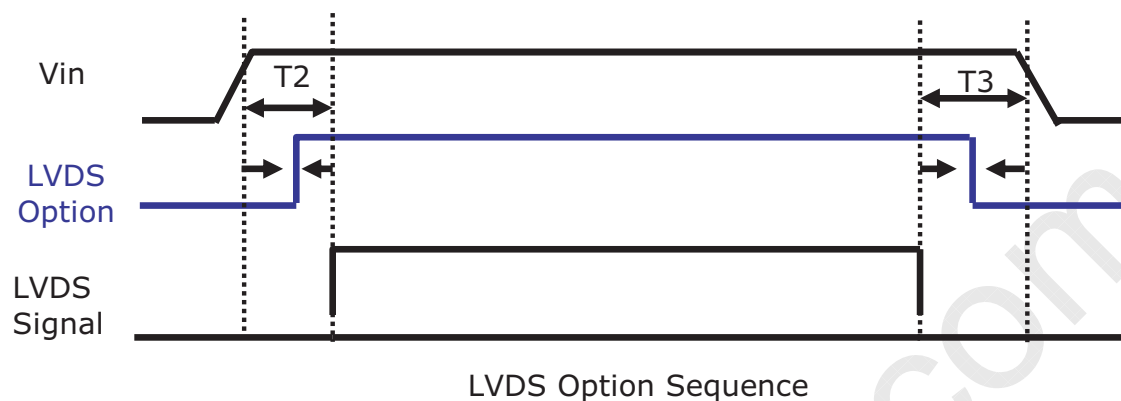
Note (3) Pin number starts from Left side

Pin No. 1   Pin No. 51
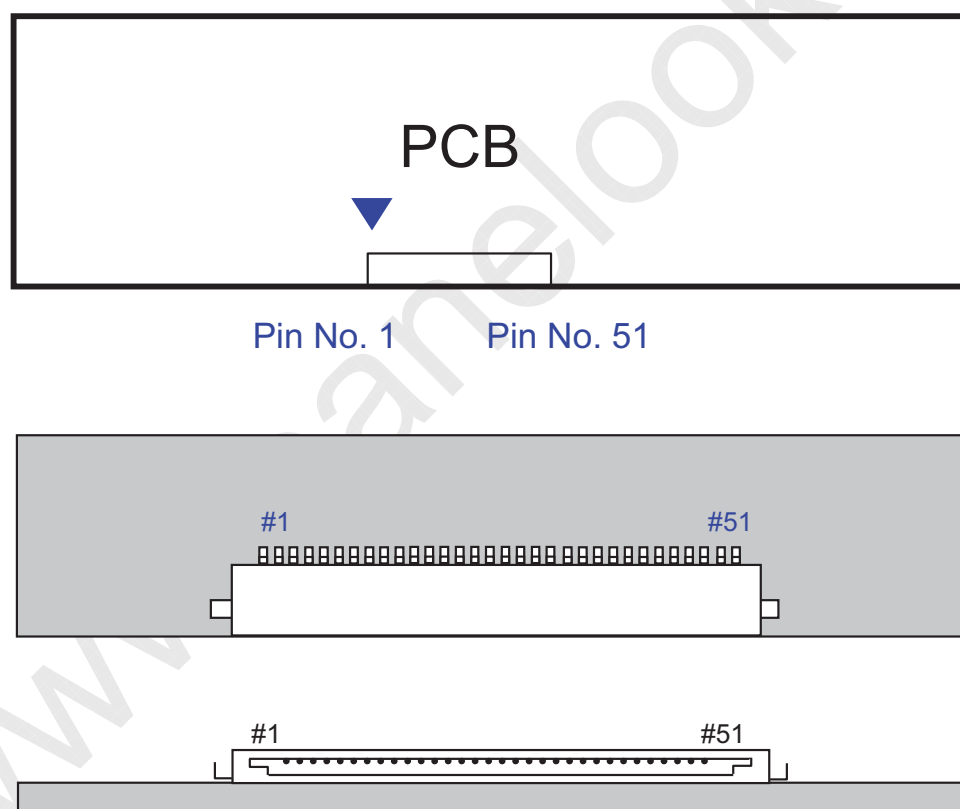
Fig. Connector diagram

a. Power GND pins should be connected to the LCD's metal chassis.

b. All power input pins should be connected together.

c. All NC pin should be separated from other signal or power.

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	14 / 28

4.2. Inverter Input Pin Configuration

SAMSUNG SECRET

Connector : Yeon-ho, 20022WR-14B1

Pin No.	Pin Configuration (FUNCTION)
1	Vin (24 V)
2	Vin (24 V)
3	Vin (24 V)
4	Vin (24 V)
5	Vin (24 V)
6	GND
7	GND
8	GND
9	GND
10	GND
11	**No Connection (DO NOT CONNECT)**
12	Backlight On /Off [ON: 2.4 ~ 5.5 V, OFF: 0 ~ 0.8 V]
13	Dimming Control [0V: Min, 3.3V: Max]
14	**No Connection (DO NOT CONNECT)**

Note(1) If use Dimming Control, Pin 14 Must be N.C

4.3. Inverter Input Power Sequence
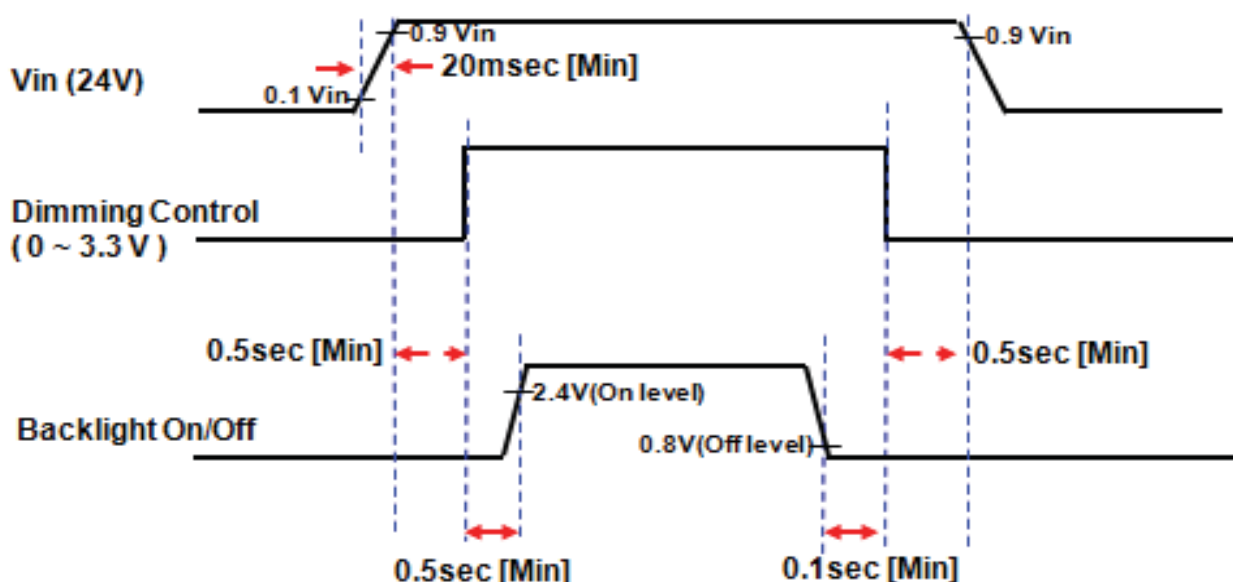
Note) SEQUENCE : ON = Vin(24V) > Dimming Control ≥ Backlight On/Off
OFF = Backlight On/Off ≥ Dimming Control > Vin(24V)

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	15 / 28

4.4 LVDS Interface

SAMSUNG SECRET

- LVDS Receiver : T-con (merged)
- Data Format (JEIDA & Normal Data Format)

	LVDS pin	JEIDA -DATA	VESA-DATA
TxOUT/RxIN0	TxIN/RxOUT0	R2	R0
	TxIN/RxOUT1	R3	R1
	TxIN/RxOUT2	R4	R2
	TxIN/RxOUT3	R5	R3
	TxIN/RxOUT4	R6	R4
	TxIN/RxOUT6	R7	R5
	TxIN/RxOUT7	G2	G0
TxOUT/RxIN1	TxIN/RxOUT8	G3	G1
	TxIN/RxOUT9	G4	G2
	TxIN/RxOUT12	G5	G3
	TxIN/RxOUT13	G6	G4
	TxIN/RxOUT14	G7	G5
	TxIN/RxOUT15	B2	B0
	TxIN/RxOUT18	B3	B1
TxOUT/RxIN2	TxIN/RxOUT19	B4	B2
	TxIN/RxOUT20	B5	B3
	TxIN/RxOUT21	B6	B4
	TxIN/RxOUT22	B7	B5
	TxIN/RxOUT24	HSYNC	HSYNC
	TxIN/RxOUT25	VSYNC	VSYNC
	TxIN/RxOUT26	DEN	DEN
TxOUT/RxIN3	TxIN/RxOUT27	R0	R6
	TxIN/RxOUT5	R1	R7
	TxIN/RxOUT10	G0	G6
	TxIN/RxOUT11	G1	G7
	TxIN/RxOUT16	B0	B6
	TxIN/RxOUT17	B1	B7
	TxIN/RxOUT23	RESERVED	RESERVED

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	16 / 28

SAMSUNG SECRET

4.5 Input Signals, Basic Display Colors and Gray Scale of Each Color

COLOR	DISPLAY (8bit)	RED								GREEN								BLUE								GRAY SCALE LEVEL
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~ R252
	↓	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	LIGHT	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253
		0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R255
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK ↑	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~ G252
	↓	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	LIGHT	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G253
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G254
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G255
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~ B252
	↓	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B253
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B254
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	B255

Note) Definition of Gray :

    Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

    Input Signal : 0 = Low level voltage, 1 = High level voltage

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	17 / 28

SAMSUNG SECRET

5. Interface Timing

5.1 Timing Parameters （DE only mode）

SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	Unit	NOTE
Clock	Frequency	$1/T_C$	130	148.5	160	MHz	-
Hsync		F_H	48	67.5	75	KHz	-
Vsync		F_V	45	60.0	65	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	-	1080	-	Lines	-
	Vertical Total	T_V	1092	1125	1380	Lines	-
Horizontal Display Term	Active Display Period	T_{HD}	-	1920	-	Clocks	-
	Horizontal Total	T_H	2090	2200	2350	clocks	-

Note) This product is DE only mode. The input of Hsync & Vsync signal does
　　　 not have an effect on normal operation.
　　(1) Test Point : TTL control signal and CLK at LVDS Tx input terminal in system
　　(2) Internal V_{DD} = 3.3V
　　(3) Spread spectrum
　　　　- Modulation rate (max) : $\pm$ 1.5 %
　　　　- Modulation Frequency : under 150KHz

5.2 LVDS Input Data Characteristics

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Input Data Position	F_{IN}=85MHz	t_{RSRM}	-	-	400	ps	
		t_{RSLM}	-400	-	-	ps	
Input common mode voltage		V_{CM}	0.2	1.2	2.0	V	-
Differential Input Voltage		$|V_{ID}|$	100	-	600	mV	-

Note) When the skew is measured the Spread Spectrum should be 0%

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	18 / 28

SAMSUNG SECRET

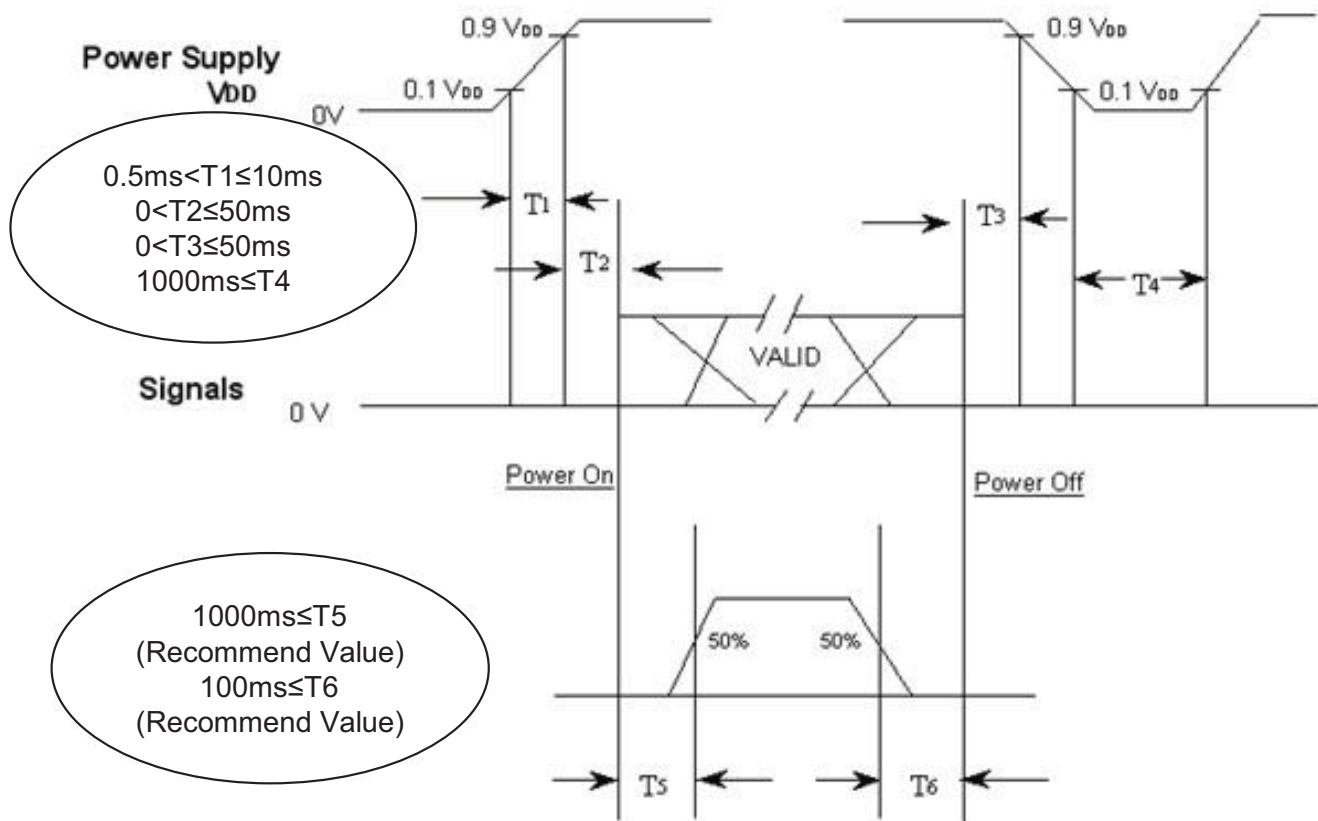## 5.3 Timing diagrams of interface signal (DE only mode)
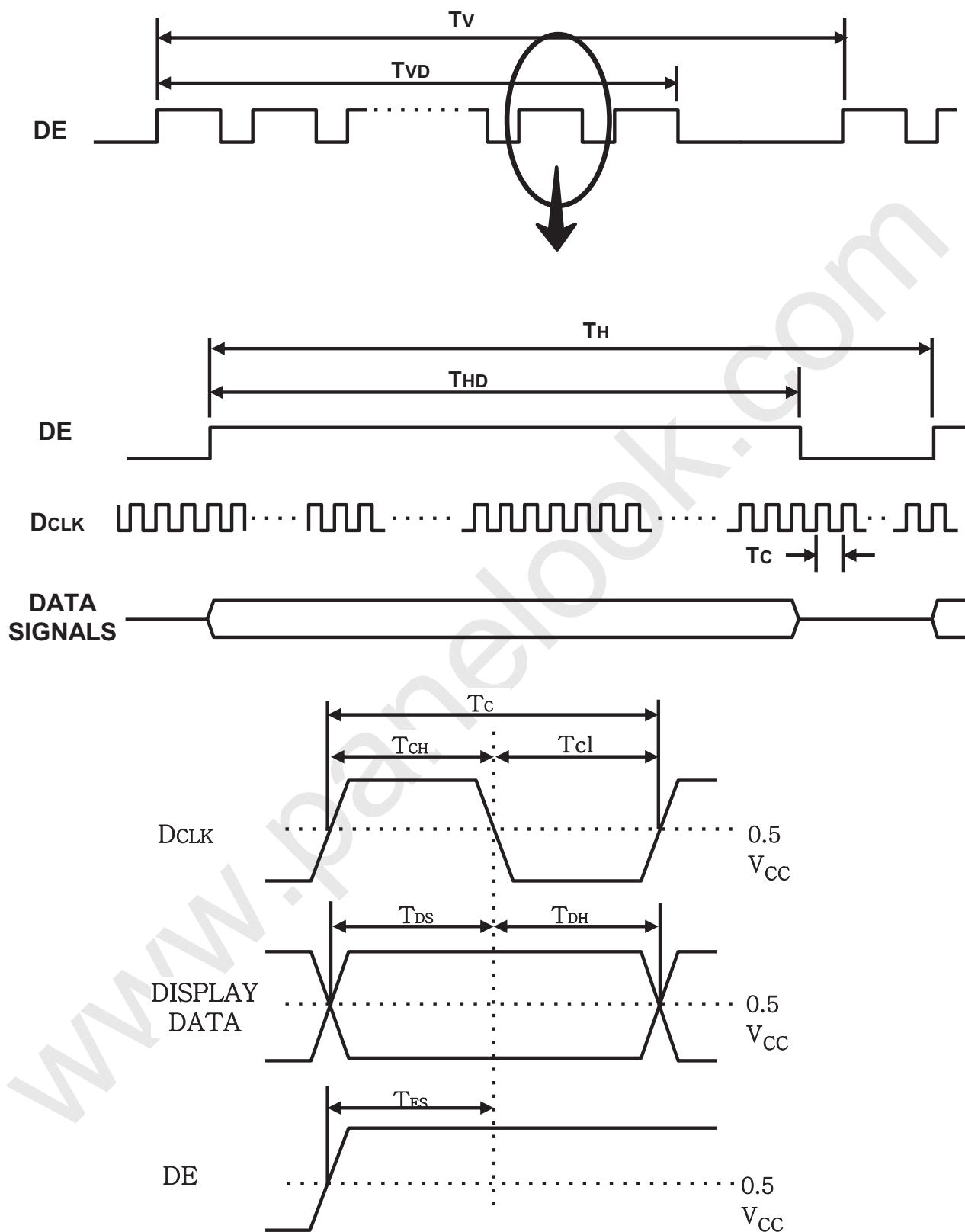
5.4 Power ON/OFF Sequence

  To prevent a latch-up or DC operation of the LCD Module, the power on/off sequence should be as the diagram below.

0.5ms<T1≤10ms
0<T2≤50ms
0<T3≤50ms
1000ms≤T4

1000ms≤T5
(Recommend Value)
100ms≤T6
(Recommend Value)

T1 : V_{DD} rising time from 10% to 90%
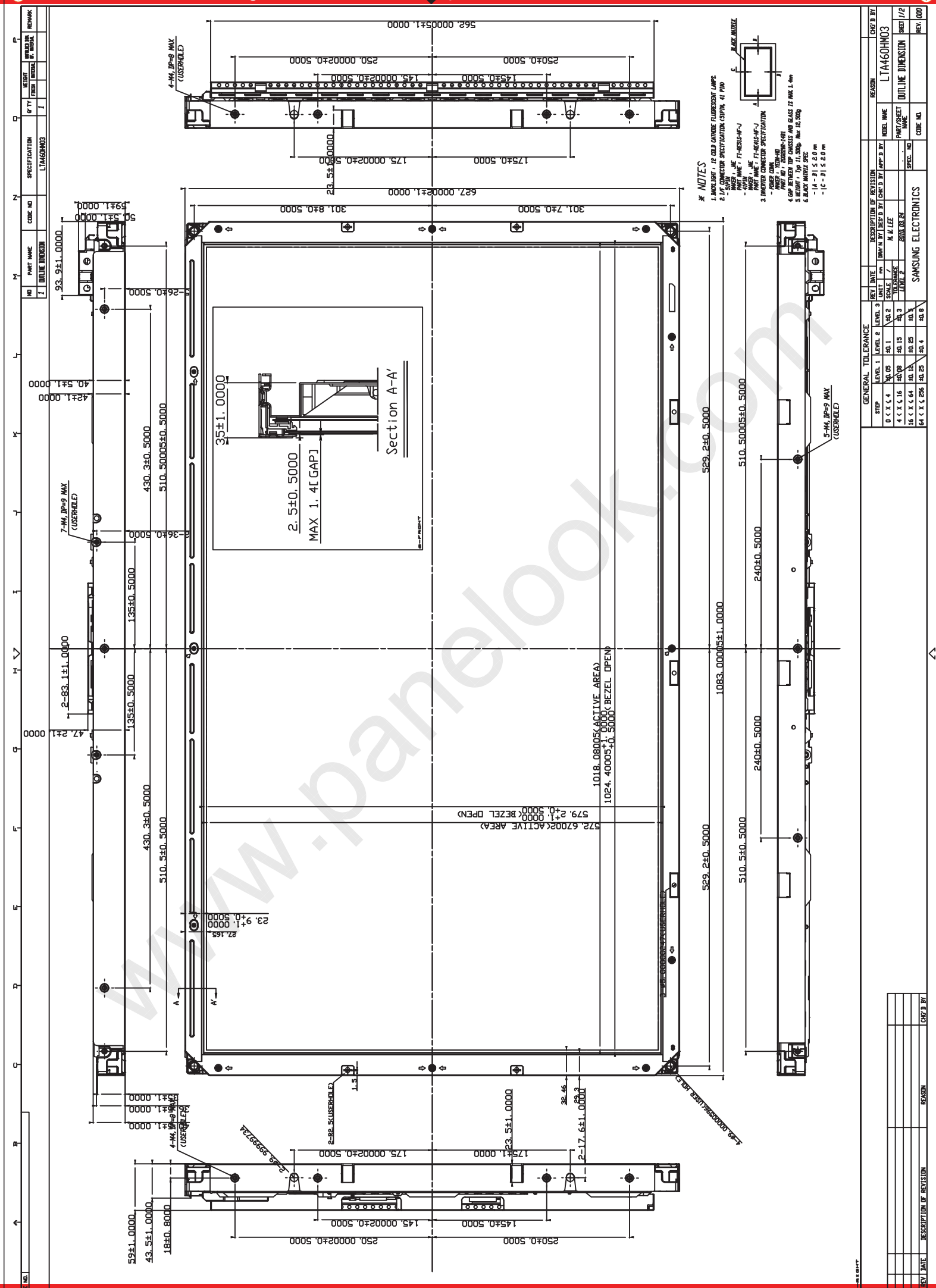T2 : The time from V_{DD} to valid data at power ON.
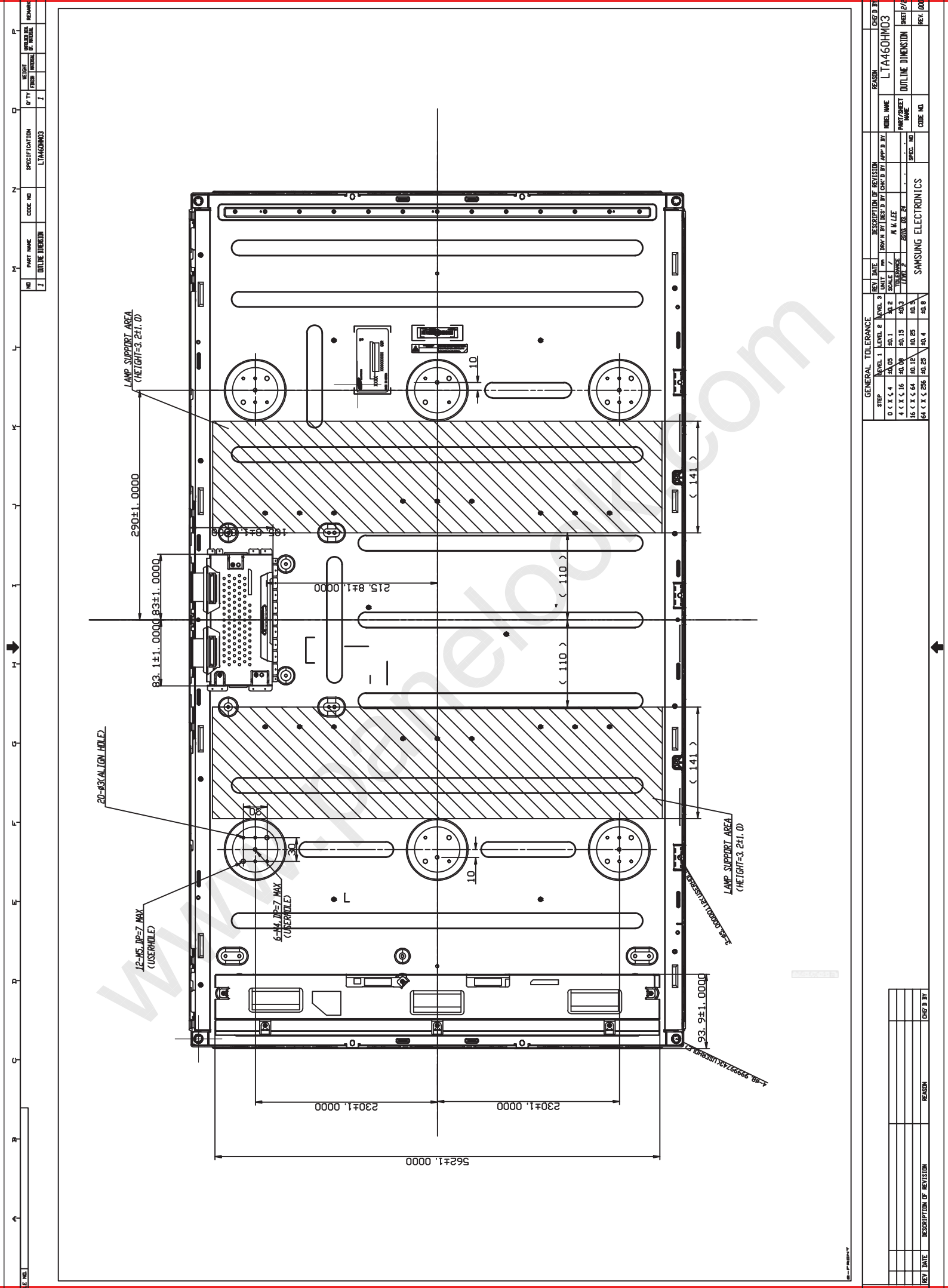T3 : The time from valid data off to V_{DD} off at power Off.
T4 : V_{DD} off time for Windows restart
T5 : The time from valid data to B/L enable at power ON.
T6 : The time from valid data off to B/L disable at power Off.

- The supply voltage of the external system for the Module input should be the same as the definition of V_{DD}.
- Apply the lamp voltage within the LCD operation range. When the back light turns on before the LCD operation or the LCD turns off before the back light turns off, the display may momentarily show abnormal screen.
- In case of V_{DD} = off level, please keep the level of input signals low or keep a high impedance.
- T4 should be measured after the Module has been fully discharged between power off and on period.
- Interface signal should not be kept at high impedance when the power is on.

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	20 / 28

SAMSUNG ELECTRONICS

LTA460HM03

OUTLINE DIMENSION

MODEL NAME

SHEET 1/2

REV. 000

N W LEE 2010.03.24

NOTES

1. BACKLIGHT : 12 COLD CATHODE FLUORESCENT LAMPS.
2. I/F CONNECTOR SPECIFICATION (51PIN, 41 PIN)
   - 51PIN
     MAKER : JAE
     PART NAME : FI-RE51S-HF-J
   - 41PIN
     MAKER : JAE
     PART NAME : FI-RE41S-HF-J
3. INVERTER CONNECTOR SPECIFICATION
   - POWER CONN.
     MAKER : YEON-HO
     PART NO. : 20025W-14H
4. GAP BETWEEN TOP CHASSIS AND GLASS IS MAX 1.4mm
5. WEIGHT : Typ 11,500g, Max 12,500g
6. BLACK MATRIX SPEC
   - |A - B| ≤ 2.0mm
   - |C - D| ≤ 2.0mm

Section A-A'

MAX 1.4[GAP]

2.5±0.5000

35±1.0000

1018.0800(ACTIVE AREA)
1024.4000+1.0000/+0.5000(BEZEL OPEN)

572.6700(ACTIVE AREA)
579.2+1.0000/+0.5000(BEZEL OPEN)

562.0000±1.0000
250±0.5000
250±0.5000
145.0000±0.5000
145.0000±0.5000

175.0000±0.5000
175.0000±0.5000
23.5±0.5000

627.0000±1.0000
301.7±0.5000
301.8±0.5000

93.9±1.0000
50.5±1.0000
69±1.0000

40.5±1.0000
42±1.0000

430.3±0.5000
510.5000±0.5000
135±0.5000
135±0.5000

529.2±0.5000
510.5000±0.5000
240±0.5000
240±0.5000

1083.0000±1.0000

47.2±1.0000

23.9±1.0000/+0.5000
27.165

32.46
123.5±1.0000
175.0000±0.5000
175.0000±0.5000

59±1.0000
43.5±1.0000
18±0.8000

145.0000±0.5000
250±0.5000
145.0000±0.5000
250±0.5000

4-M4,DP-8 MAX (USERHOLE)
7-M4,DP-9 MAX (USERHOLE)
5-M4,DP-9 MAX (USERHOLE)
4-M4,DP-9 MAX (USERHOLE)

2-83.1±1.0000

BLACK MATRIX

GENERAL TOLERANCE

STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X < 4	±0.05	±0.1	±0.2
4 < X < 16	±0.08	±0.15	±0.3
16 < X < 64	±0.1	±0.2	±0.4
64 < X < 256	±0.25	±0.4	±0.8

7. Reliability Test

SAMSUNG SECRET

Item	Test condition	Quantity
TSS	-20℃ ~ 65℃, 440cycle determination	4EA
HTOL	50℃/60℃, 500hr determination	4EA
LTOL	-5℃, 500hr determination	4EA
HTS	70℃, 500hr determination	4EA
LTS	-25℃, 500hr determination	4EA
THB	50℃ / 90%RH, 500Hr determination	4EA
TS	-20℃ 0.5Hr → 60℃ 0.5Hr, 100cycle determination	4EA
ESD (non-operation)	Converter input connector : ±15 kV, 150pF/330 Ω, 3times/pin LED input connector : ±4 kV, 150pF/330 Ω, 3times/pin	3EA
ESD(operation)	contact : ±10 kV, 150pF/330Ω, 210 Point, 1 time/Point air : ± 20kV, 150pF/330Ω, 210 Point, 1 time/Point	3EA
POWER ON/OFF	-5℃/60℃, 3sec (on) / 2sec(off), 1000 times	4EA
Vibration	10 ~ 300Hz : 1.5G/10minSR, XYZ, 30min/axis [30~ 50Hz : 3G/10minSR, XYZ, 30min/axis]	3EA
Shock	50G 11msec , ±XYZ 1time/axis	3EA
Acoustic Noise	Electromagnetic noise : below 24dB Expansion/ Contraction noise by Heat : Max 50dB (Do not exceed 36dB more than 10times)	2EA
Temperature Humidity Stress	-20℃ ~ 65℃, 0 ~ 90%RH, 2cycle	4EA
PALLET Vibration	5~200Hz , 1.05Grms, Random 2Hr / Y	1PALLET
PALLET Drop	20cm, 2Edge	1PALLET
Complex	WHTS : Pallet Vibration/ Drop → WHTS → THB 48Hr HTS, LTS : Pallet Vibration/ Drop → HTS, LTS → HTOL 48Hr	WHTS 10EA HTS 4EA LTS 4EA

[Result Evaluation Criteria]

Under the display quality test conditions with normal operation state, these should be no change which may affect practical display functions.

* HTOL/ LTOL : High/Low Temperature Operating Life
** THB : Temperature Humidity Bias
*** HTS/LTS : High/Low Temperature Storage

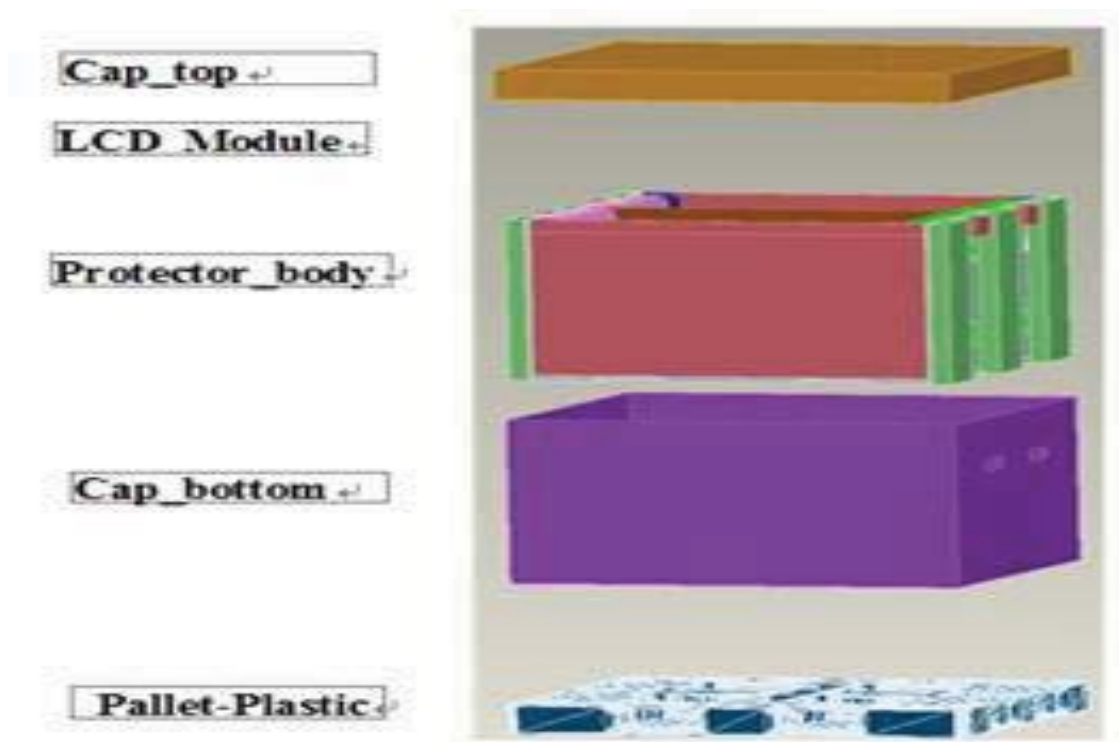| MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	23 / 28

8. PACKING

8.1 CARTON (Internal Package)
(1) Packing Form
    Corrugated fiberboard box and corrugated cardboard as shock absorber
(2) Packing Method
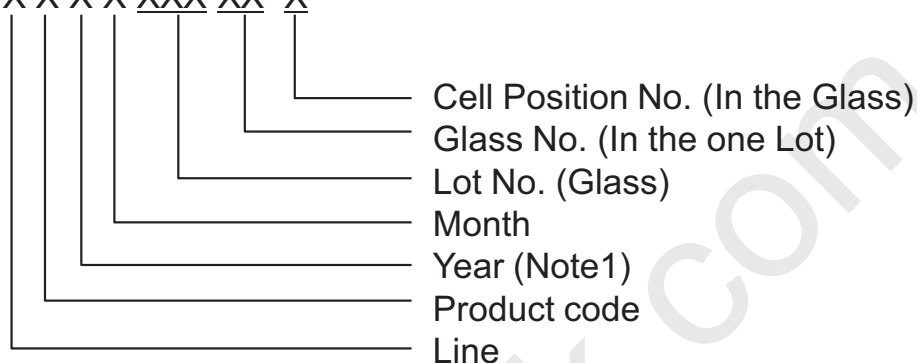

8.2 Packing Specification

Item	Specification	Remark
LCD Packing	13ea / (Packing-Pallet Box)	1. 12 Kg / LCD (13ea) 2. 10 Kg / Protector body (1ea) 3. 7 Kg / Packing-Pallet Box (1ea) >. Packing-Pallet Box Material : DW4
Pallet	1 Box / Pallet	1 Pallet weight = 8kg
Packing Direction	Vertical	
Total Pallet Size	H x V x height	1245mm(H) x 1130mm(V) x 677mm(height)
Total Pallet Weight	181kg	Pallet(8kg) + Module(12*13=156Kg) + Protector Body(10kg) + Packing-Pallet Box(up+botton=7kg)

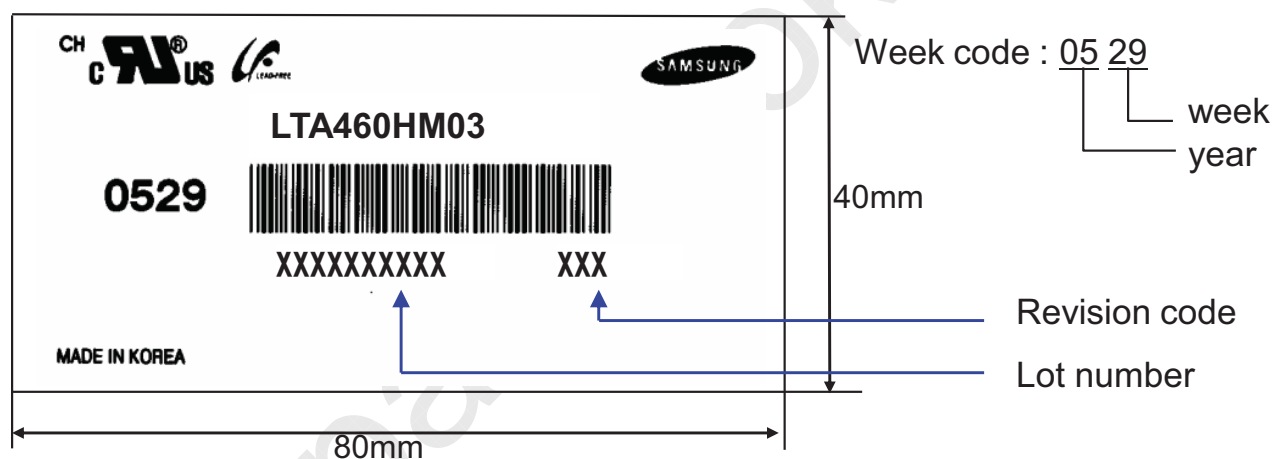| MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	24 / 28

SAMSUNG SECRET

9. MARKING & OTHERS

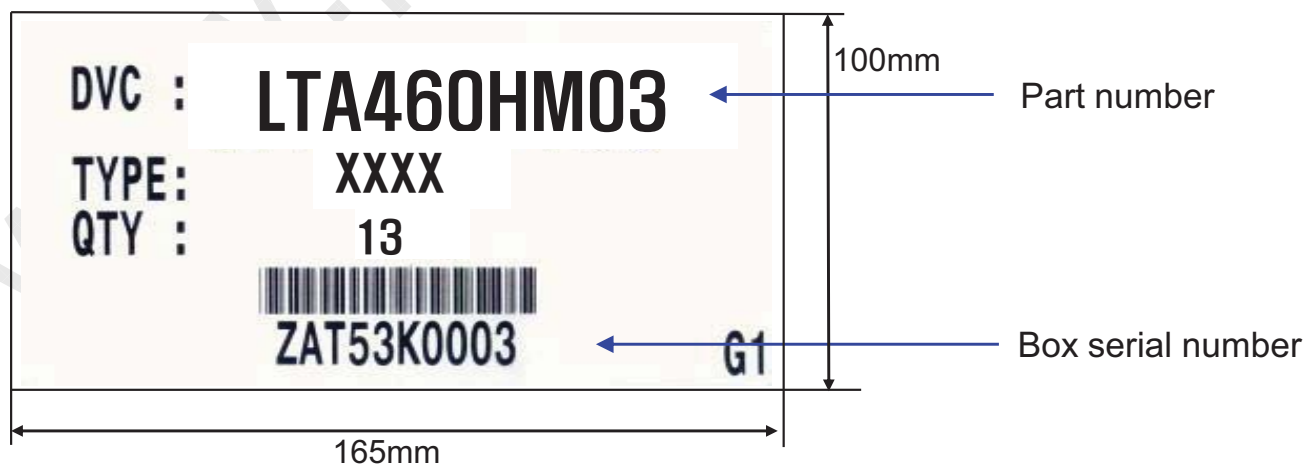A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

(1) Part number : LTA460HM03
(2) Revision: Three letters
(3) Lot number : X X X X XXX XX X

- Cell Position No. (In the Glass)
- Glass No. (In the one Lot)
- Lot No. (Glass)
- Month
- Year (Note1)
- Product code
- Line

(4) Nameplate Indication

LTA460HM03

0529

XXXXXXXXXX   XXX

MADE IN KOREA

80mm

40mm

Week code : 05 29
— week
— year

Revision code

Lot number

(5) Packing box attach

DVC : **LTA460HM03**
TYPE: XXXX
QTY : 13
ZAT53K0003   G1

100mm

Part number

Box serial number

165mm

(6) Others
  1. After service part
     Lamps cannot be replaced because of the narrow bezel structure.

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	25 / 28

10. General Precautions

10.1 Handling

(a) When the Module is assembled, it should be attached to the system firmly
    using all mounting holes. Be careful not to twist and bend the Module.

(b) Because the inverter use high voltage, it should be disconnected from power
    before it is assembled or disassembled.

(c) Refrain from strong mechanical shock and / or any force to the Module.
    In addition to damage, this may cause improper operation or damage to the Module
    and CCFL back light.

(d) Note that polarizers are very fragile and could be damage easily.
     Do not press or scratch the surface harder than a HB pencil lead.

(e) Wipe off water droplets or oil immediately. If you leave the droplets for a long
    time, staining or discoloration may occur.

(f) If the surface of the polarizer is dirty, clean it using absorbent cotton or soft cloth.

(g) Desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane.
    Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid
    or Methyl chloride. It might permanent damage to the polarizer due to chemical
    reaction.

(h) If the liquid crystal material leaks from the panel, it should be kept away
    from the eyes or mouth . In case of contact with hands, legs or clothes, it must
    be washed away with soap thoroughly.

(i) Protect the module from Electrostatic discharge. Otherwise the ASIC IC or
    semiconductor would be damaged.

(j) Use finger-stalls with soft gloves in order to keep display clean during the
    incoming inspection and assembly process.

(k) Do not disassemble the Module.

(l) Do not disassemble shield case of inverter & LVDS board

(m) Do not connect N.C pins. (Samsung internal use only)

(n) Protection film for polarizer on the Module should be slowly peeled off just before use
    so that the electrostatic charge can be minimized. Must put on antistatic glove while
    handling a module

(o) Pins of I/F connector should not be touched directly with bare hands.

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	26 / 28

SAMSUNG SECRET

10.2 Storage

ITEM	UNIT	Min.	Max.
Storage Temperature	(℃)	5	40
Storage Humidity	(%rH)	35	75
Storage Life	12 months		
Storage Condition	- The storage room should provide good ventilation and temperature control. - Products should not be placed on the floor, but on the Pallet away from a wall. - Prevent products from direct sunlight, moisture nor water; Be cautious of a build up of condensation. - Avoid other hazardous environment while storing goods. - If products delivered or kept in conditions of over the storage period of 3months, the recommended temperature or humidity range, we recommend you leave them at a temperature of 20℃ and a humidity of 50% for 24 hours.		

10.3 Operation

(a) Do not connect or disconnect the Module in the "Power On" condition.

(b) Power supply should always be turned on/off by the "Power on/off sequence"

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

(d) The cable between the back light connector and its inverter power supply should be connected directly with a minimized length. A longer cable between the back light and the inverter may cause lower luminance of lamp(CCFL) and may require higher startup voltage(Vs).

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	27 / 28

10.4 Operation Condition Guide

(a) The LCD product should be operated under normal conditions.
    Normal condition is defined as below;
    - Temperature : 20±15℃
    - Humidity : 55±20%
    - Display pattern : continually changing pattern (Not stationary)

(b) If the product will be used in extreme conditions such as high temperature,
    humidity, display patterns or operation time etc.., It is strongly recommended
    to contact SEC for Application engineering advice. Otherwise, its reliability and
    function may not be guaranteed. Extreme conditions are commonly found at
    Airports, Transit Stations, Banks, Stock market, and Controlling systems.

10.5 Others

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection
    of electrode.

(c) Do not exceed the absolute maximum rating value. (supply voltage variation,
    input voltage variation, variation in part contents and environmental temperature,
    and so on)
    Otherwise the Module may be damaged.

(d) If the Module keeps displaying the same pattern for a long period of time,
    the image may be "sticked" to the screen.
    To avoid image sticking, it is recommended to use a screen saver.

(e) This Module has its circuitry PCB's on the rear side and should be handled
    carefully in order not to be stressed.

(f) Please contact SEC in advance when you display the same pattern for a long time.

MODEL	LTA460HM03	Doc. No	06-000-G-20120110	Page	28 / 28